
Logistics Management Institute

Defense Transportation EDI Interface Integrity

DF501MR1

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March 1996

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Prepared pursuant to Department of Defense Contract DASW01-95-C-0019. The views expressed here are those of the Logistics Management Institute at the time of issue but not necessarily those of the Department of Defense. Permission to quote or reproduce any part except for government purposes must be obtained from the Logistics Management Institute.

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Contents

Background	1
Overview of EDI Operating Concept	2
Improving Interface Integrity	3
Interface Control	4
Software Failures	5
Data Quality	7
Summary	11

Defense Transportation EDI Interface Integrity

BACKGROUND

In February 1995, the Defense Finance and Accounting Service – Indianapolis Center (DFAS-IN) began paying freight transportation electronic invoices using a new automated system, Defense Transportation Payment System (DTRS). The operating concept for DTRS calls for Department of Defense (DoD) shipping activities to pre-position shipment information on the Military Traffic Management Command's (MTMC's) CONUS Freight Management (CFM) system for subsequent transmission to DTRS. All transactions are to occur using electronic data interchange (EDI) techniques.

After extensive development and testing, these transactions are occurring on a regular basis. However, DTRS rejects approximately 7 percent of the carriers' EDI invoices — about 1,200 per month — because of the unavailability of matching electronic government bill of lading (GBL) shipment information.

While 1,200 invoice rejections out of approximately 17,000 monthly EDI invoices are currently manageable, the number of rejections will increase dramatically when the Defense transportation's payment program is fully implemented. Nonetheless, these missing GBLs cause a significant disruption of normal payment processing at DFAS-IN, MTMC, and the shippers, requiring labor-intensive manual research to locate electronic GBLs.

The Defense transportation community's inability to correct its processing problems imposes several other penalties on the payment program, including the following:

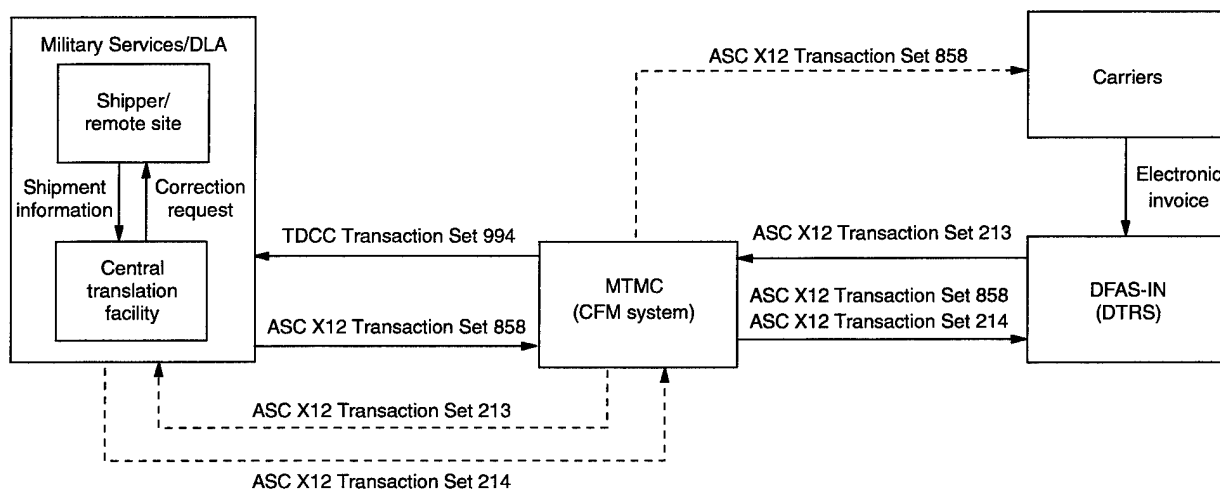
- ◆ The government may pay interest to carriers due to the violation of the mandatory prompt payment requirement.
- ◆ Late bill payment places an adverse financial burden on some carriers.
- ◆ Some valid bills from carriers are rejected and must be resubmitted on paper.
- ◆ Missing shipment information raises distrust among Defense transportation trading partners and erodes carrier industry confidence in DoD's EDI payment procedures.

Dr. John Hamre, Under Secretary of Defense (Comptroller), and Dr. Paul Kaminski, Under Secretary of Defense (Acquisition and Technology), in a 24 July 1995 memorandum called for accelerated use of EDI techniques in paying

transportation invoices. These data problems, however, are delaying the transportation community's ability to satisfy their requirement.

OVERVIEW OF EDI OPERATING CONCEPT

Figure 1 provides an overview of DoD's operating concept for using EDI techniques to pay transportation invoices. It is initiated when a carrier picks up a shipment at a DoD shipper activity. The activity uses the services of a central translation activity to formulate and transmit the GBL, Accredited Standards Committee (ASC) X12 Transaction Set 858, Shipment Information, to MTMC. This process employs electronic, but not EDI, interfaces in the information exchange.



Note: The dotted lines represent processes that were planned in the original operating concept but have not yet been implemented. Although not shown in the figure, all EDI transactions require ASC X12 Transaction Sets 997, Functional Acknowledgment, from receiving activities. DLA = Defense Logistics Agency; TDCC = Transportation Data Coordinating Committee.

Figure 1.
Defense Transportation Traffic Flow Supporting the EDI Operating Concept

The CFM system acknowledges receipt of the electronic GBL with two transactions. An ASC X12 Transaction Set 997, Functional Acknowledgment, indicates receipt of the transaction; it may also reject the transaction because of a syntactical error. A TDCC Transaction Set 994 acknowledges receipt of a transaction by the application program after its translation from EDI; it may also request a correction to particular data fields or reject the transaction on the basis that critical information is either missing, incorrect, or the transaction references a duplicate GBL number.

After receiving an electronic invoice from a carrier, DTRS requests an electronic GBL from the CFM system using Transaction Set 213, Motor Carrier Shipment Status Inquiry. If the CFM system cannot locate a pre-positioned GBL, it

returns a Transaction Set 214, Transportation Carrier Shipment Status Message, to DTRS to indicate that no record is on file.

The intended purpose of Transaction Set 214 is to alert DFAS-IN when a carrier has submitted an invoice for which there is no shipment information on record. However, GBL information may also be missing because of system or software failures or data quality problems. The only means for distinguishing between a legitimate Transaction Set 214 and a variety of performance anomalies is through manual research.

IMPROVING INTERFACE INTEGRITY

The absence of GBLs that correspond to carrier invoices adversely impacts DoD's payment process in two ways: invoices are returned for carriers to resubmit on paper and the manual effort expended to locate missing GBLs is time-consuming and expensive. The reasons why GBLs may not be available arise because of the following:

- ◆ *Interface control.* Records are lost between the shipper and central translation facilities. While built-in acknowledgment processes provide adequate protection for the exchange of EDI transactions, the integrity of those interfaces is undermined by inadequate reconciliation and monitoring procedures for the non-EDI exchanges.
- ◆ *Software failures.* Software problems in the CFM system interfere with GBL retrieval and processing.¹
- ◆ *Data quality.* Poor data quality affects GBL availability in two ways:
 - ▶ *A transaction is available, but inaccessible.* This situation occurs when the GBL number and government bill of lading office location code (GBLOC) do not match.
 - ▶ *A transaction is unavailable due to prior rejection.* Transactions may not be available to the CFM system because they have been rejected due to critical data errors.

Lack of adequate interface controls and software problems each accounted for about 40 percent of the missing GBLs over the period of this study, while poor data accounted for the remaining 20 percent. Sometimes, however, as in the case of fraudulent invoices, GBLs are supposed to be missing. Our research shows that the transportation payment process has no efficient way of tracking missing electronic GBLs back to the shipper to determine their validity. As a

¹Recently, the CFM system has experienced two separate software problems that result in missing GBL information. One interrupts the search process before it is successfully completed; the other prohibits generation of a Transaction Set 214. MTMC is in the process of correcting these problems.

result, it also lacks the means to distinguish between legitimately and erroneously missing GBLs.

Interface Control

The loss of EDI transactions has been suspected to be occurring between either shipper systems and the CFM system or DTRS and the CFM system. Upon investigation, we discovered that, while EDI exchanges occasionally fail, they are not major. Errors in EDI transmissions and EDI processing failures are easily detected. EDI interfaces owe their integrity to the automatic, translator-generated Functional Acknowledgments that identify missing transactions and report the syntactical correctness of each transaction.

The majority of data losses arise because the CFM system never received shipment information from a shipper activity. In other words, the missing transactions are not lost by the EDI network but are lost between the shipper activity and its central translation facility — before they are translated to an EDI format.

Shipment information originating at a shipper activity is sent in a flat-file format to a central translation facility. This interface does not protect the movement of shipment information by automated acknowledgments like EDI interfaces. Moreover, the shipper loses control over the data after they are entered into the shipper's system. At the Defense Depot — Richmond, for example, the shipper's computer display indicates that data are transmitted to the central translation facility upon completion of GBL entry. In fact, no transmission will yet have taken place. Rather, the newly entered shipment data are passed to a communications center, bundled with other flat files, and transmitted to the central translation facility at a later time. The shipper, isolated from these subsequent stages, is unable to detect any breakdown in the flow of flat-file shipment information.

CAUSE OF THE PROBLEM

All DoD transportation systems use file transfer protocol (FTP) to exchange both EDI and non-EDI shipment information with trading partner systems. FTP is a reliable protocol — protected by usual communications protocol error checks — but it fails to provide adequate end-to-end transmission assurance. While failures in FTP flat-file transmission are infrequent, they do occur because of human error or temporary technical difficulties. FTP provides inadequate reporting for such failures to protect unattended operation.

EDI exchanges between Defense transportation systems are accompanied by Functional Acknowledgment transactions, which overcome the weakness of FTP reporting. Such end-to-end EDI acknowledgments provide adequate internal data controls and permit a timely awareness whenever incomplete exchanges occur. However, Functional Acknowledgments alone — without proper

resources and management procedures to monitor and reconcile problems — allow transmission problems to go unnoticed.

Non-EDI interfaces (unlike EDI interfaces) are vulnerable to the vagaries of transmission errors. They are not protected by overarching end-to-end acknowledgments; they also lack the reconciliation processes for transferred data acknowledgments. As a result, data losses occur in non-EDI exchanges, usually without awareness.

RECOMMENDED SOLUTION

Defense transportation system managers need to develop formal audit procedures when exchanging EDI data. At a minimum, those procedures should direct resources to review Functional Acknowledgment reports, reconcile exceptions, and communicate problems to trading partners.

Shippers and central translation sites need to establish flat-file acknowledgments similar to the Functional Acknowledgments employed in EDI exchanges. A flat-file acknowledgment can be a simple message returned to a shipper location that cites GBL numbers and a count of GBLs received in each flat-file transmission.

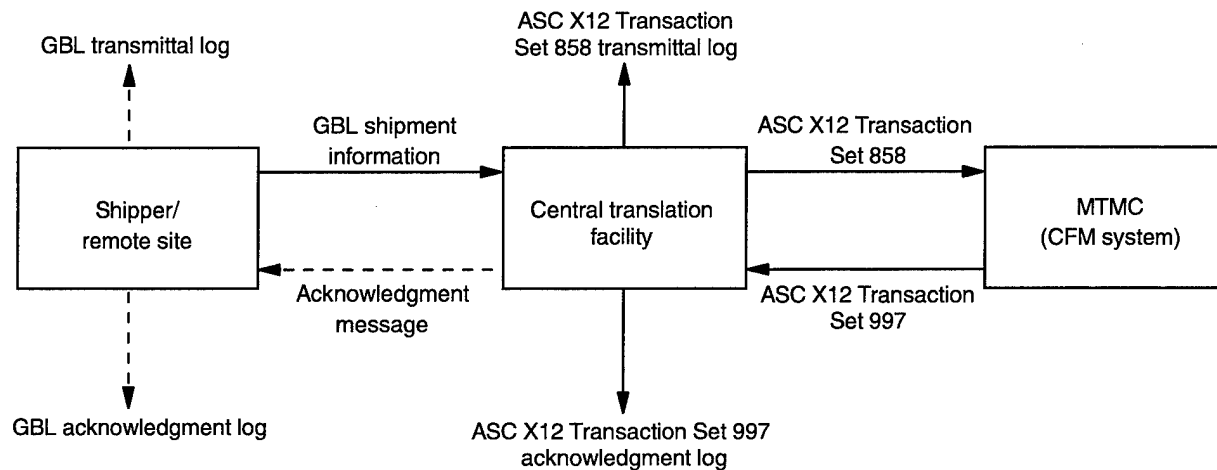
As with EDI exchanges, a non-EDI acknowledgment process will be useful only if accompanied by reconciliation procedures. Shipper systems can be enhanced to produce logs as an automatic byproduct of generating shipment information, and those logs should be reconciled against the transmission acknowledgments. Such reconciliation would enable a trading partner's timely recognition of discrepancies between GBLs sent and those received; it would also permit early correction or retransmission at the shipper sites. Figure 2 presents proposed concept of operations supporting such features.

In response to Dr. Hamre's and Dr. Kaminski's initiative for accelerated use of EDI techniques in paying transportation invoices, LMI developed, and the U.S. Transportation Command (USTRANSCOM) distributed, a concept of operations incorporating these features. As a result, the Military Services and DLA are now implementing improvements to their interface controls.

Software Failures

Modifying or upgrading software carries a high risk for introducing errors. While conducting research for this task, two such errors resulted from a change in the hardware platform of the CFM system. Both resulted in a breakdown in the CFM system's ability to deliver GBLs to DTRS. The first error caused an occasional cessation of processing during the CFM system's searches for GBLs to match invoices that DTRS received. The other error resulted in the system refusing to generate Transaction Set 214 notifications for some GBLs not on file in the CFM system. We cite these particular problems because they typify the kinds of

software failures the Defense transportation EDI program will continue to experience as it expands and matures. The significance of these problems is that they are indistinguishable from the other causes of missing GBLs.



Note: The dotted lines represent processes that should be added to the current operating concept to support adequate internal controls.

Figure 2.
Interface Controls Operating Concept

CAUSE OF THE PROBLEM

Many of these types of software problems occur because of inadequate testing of all aspects of the software performance in a new platform environment. Clearly, operations were transferred to the new platform prematurely. Although these particular software problems were not perceived immediately, MTMC eventually identified their causes. However, when it determined the affected GBLs, MTMC failed to identify those GBL numbers for DFAS-IN, which adversely compounded the effects of the problem.

RECOMMENDED SOLUTION

A sound approach to handling software problems is to take all necessary measures to minimize their effects on operations. We believe it is imperative for the program managers of all Defense transportation systems to assign separate (i.e., off-line) hardware facilities for parallel system testing when developing, modifying, or upgrading software. New software or hardware should be employed in operations only after all perceivable aspects are identical between operational and test software. MTMC has recognized this need and has taken steps that should avoid the recurrence of similar problems in the future.

Additionally, whenever a software problem occurs — even after thorough testing — all trading partners who may be affected need to be informed of the

nature, potential implications, and actions being taken toward correction of the problem.

Data Quality

Poor data quality contributes to transaction problems in two ways: GBLs are available, but they are inaccessible because of a mismatch of search keys; and GBLs are not available because they were rejected for critical data problems.

TRANSACTION AVAILABLE, BUT INACCESSIBLE

The CFM system retrieves electronic GBLs using two search keys: GBL number and GBLOC, which together uniquely identify a shipment and its shipper. Shippers provide the GBL number and GBLOC to carriers and the CFM system — by paper for the carrier and electronically to the CFM system. Carrier invoices transmitted to DTRS also contain them and a corresponding pair are transferred in each request for shipment information (Transaction Set 213) sent to the CFM system. When the search values in Transaction Set 213 match those in a corresponding electronic GBL, the CFM system retrieves the required information.

Occasionally, either the GBL number or GBLOC on a carrier's invoice does not match the search key in the CFM system's data base; when this situation occurs, the retrieval of data fails. Even though the desired GBL may be present in the data base, the system is unable to provide DTRS with the GBL needed to support carrier payment.

Cause of the Problem

A mismatch of GBL number or GBLOC may occur because a carrier transfers the information incorrectly from a paper GBL to the electronic invoice. The paper GBL may be soiled and difficult to read, letters or numbers may be transposed during data entry, or the carrier may use an incorrect GBLOC. (Co-located shipper activities are identified by separate GBLOCs, which confuse some carriers.) Carrier-related problems account for only 7 to 10 percent of the missing GBLs.

Another reason the search keys may fail to match is that shippers occasionally issue an erroneous GBLOC, and a carrier, recognizing the problem, corrects the information on its invoice. In those cases, the GBL number and GBLOC may be accurate, but they will not match values found in the CFM system's data base.

Recommended Solution

Shippers need to provide electronic GBLs to carriers, as initially planned for the Defense transportation system. However, carriers have indicated an unwillingness to invest in integrating electronic shipment information with their invoice application without some additional incentives. Those incentives include electronic GBLs citing the carriers' "pro-number" (i.e., the waybill or freight bill number) or offering carriers financial considerations (such as shortening the payment cycle for EDI bills). Although not as important as implementing interface controls, encouraging more carriers to become EDI-capable will improve the data quality of invoices and the likelihood of locating available GBLs.

Co-located shipping activities should also use consolidated GBLOCs, which would be less confusing to carriers and assist in eliminating incorrect GBLOCs on carrier invoices. In addition, carrier instructions should direct carriers that recognize an incorrect GBLOC to notify the shippers for release of a GBL correction notice.

TRANSACTION UNAVAILABLE DUE TO PRIOR REJECTION

The CFM system rejects GBL transactions because of poor data quality or missing data in shipper-supplied electronic GBLs. When the problems are identified, the CFM system returns a Transaction Set 994 to the shipper indicating that the GBL has been rejected and identifying required corrections. Shippers are responsible for correcting and returning rejected shipment information.

Cause of the Problem

Some data errors occur because shipper systems do not perform comprehensive source data editing. Presently, the first time critical data elements are scrutinized for correct content is when electronic GBLs arrive at the CFM system. GBLs are frequently rejected because they have not been subjected to the same edits before leaving the shipper sites. Furthermore, no centrally maintained standard reference files exist to assist shippers with the critical source data editing.

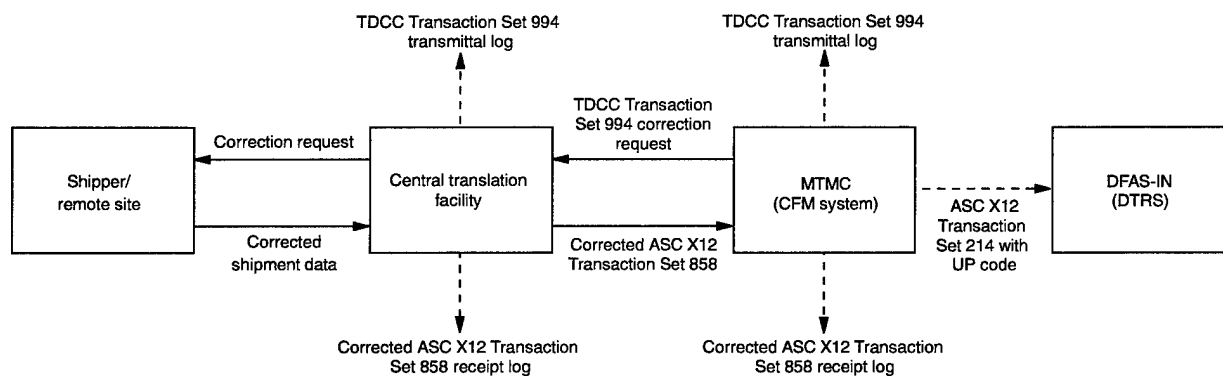
Responding to a Transaction Set 994 invokes a manual process at shipper sites or the central translation facility. Because of inadequate procedures and controls governing the correction process, shipper response is slow and unreliable. Similarly, sending correction notices to carriers is a manual, labor-intensive process that lengthens the time for returning corrected shipment information to the CFM system.

Recommended Solution

To eliminate these data quality problems, which account for as much as 10 percent of the missing electronic GBLs, shippers need to develop source data edits that are identical to those in the CFM system. The use of standard source data edits will significantly reduce the number of GBL transactions that the CFM system rejects and, thereby, minimize the error-correction workload.

For errors not caught by shipper source edits, shippers (including the central translation facility) need to establish automated error-correction procedures. In addition, MTMC needs to establish procedures for monitoring outstanding GBL corrections. Those procedures should include the creation of computer logs identifying GBLs returned to shippers for correction and corrected GBLs returned to MTMC. These types of logs would assist in maintaining agreed-upon turnaround times for error correction. The memorandum of understanding between MTMC and DFAS-IN on addressing the operating procedures for paying DoD's transportation bills electronically specifies that the CFM system must use a Transaction Set 214 to respond to an unprocessable Transaction Set 213 from DTRS when the CFM system has previously rejected the requested Transaction Set 858. A Transaction Set 214 with a "UP" code (in lieu of a Transaction Set 858) verifies the existence of a valid shipment and notifies DTRS that the shipper is processing the information.

Figure 3 proposes an operating concept for an automated error-correction capability involving remote shipper sites, central translation facility, CFM system, and DTRS. USTRANSCOM proposed this concept to the Military Services, MTMC, DLA, and DFAS-IN in response to Dr. Hamre's and Dr. Kaminski's initiative to accelerate the use of EDI for payment of transportation invoices. These automated error-correction processes are now being implemented.



Note: The dotted lines represent processes that should be added to the current operating concept to support automated error correction. Although not shown in the figure, all transactions (EDI and non-EDI) require Functional Acknowledgments by receiving activities.

Figure 3.
Proposed Automated Error-Correction Operating Concept

We also found that the CFM system uses Transaction Set 994 to reject Shipment Information transactions for legitimate shipments that have been erroneously given a previously assigned GBL number. Such transactions are mistakenly diagnosed as duplicates because the CFM system recognizes and rejects any transactions bearing a previously received GBL number and GBLOC. The advent of automated GBL generation has complicated the regulation of GBL control numbers. Shippers often lack effective procedures to identify and prevent occasional duplicate assignments, particularly those supporting multiple sites.

The lack of control in GBL number generation is more serious than the Shipment Information transactions that are incorrectly rejected. The General Services Administration's (GSA's) assignment of GBL numbers is a controlled process that is intended to create a unique, traceable identification for every shipment. GSA and DoD should convene a task group for establishing controls and procedures that disallow assignment of duplicate GBL numbers. When those controls and procedures are in place, the need for shipper corrections of misassigned GBL numbers should be eliminated.

GBL TRACKING

In DoD's transportation payment operating concept, the primary purpose of an Transaction Set 214, Transportation Carrier Shipment Status Message, is to alert DFAS-IN when a shipment has not occurred and a carrier has submitted a fraudulent or erroneous invoice. The concept calls for shipper systems to receive a Transaction Set 213 from the CFM system when a shipment record cannot be located. Shippers respond either with the appropriate electronic GBL or a status message indicating that DTRS should reject the invoice.

Presently, when the CFM system does not have a requested GBL on file, it faxes a manually prepared list to the shipper in lieu of Transaction Set 213. The CFM system also returns a Transaction Set 214 to DTRS indicating that no record is on file. The problem occurs because DTRS cannot differentiate between a Transaction Set 214 indicating the existence of an invalid invoice and one that reports the temporary unavailability of a GBL. This situation results in all GBLs not found in the CFM system's data base requiring manual resolution.

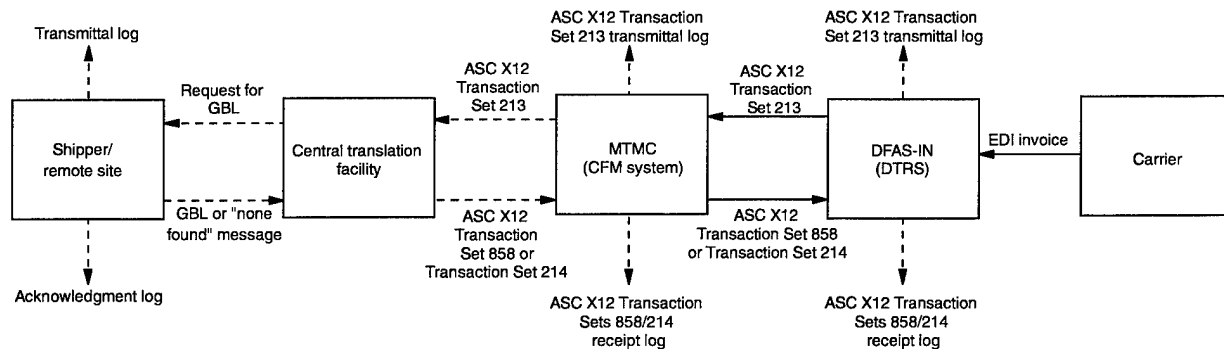
Cause of the Problem

Shipper systems lack the capability to receive Transaction Sets 213 and respond with either the missing GBL or a Transaction Set 214. Shippers also lack the capability to automatically locate missing shipment information. Resolving these problems is a tedious, labor-intensive, manual process that often results in the unavailability of GBL shipment information when it is required.

Recommended Solution

Central translation facilities need to develop the capability to receive Transaction Sets 213 from the CFM system and respond either with the appropriate electronic GBL or a Transaction Set 214 indicating the shipment did not occur and that DTRS should reject the invoice. They also need to convert the Transaction Set 213 into an appropriate shipment inquiry message and deliver it to the non-EDI shipper site. Also, the central translation facility needs to replace "none found" shipment status messages from its shipper sites with Transaction Sets 214 forwarded to the CFM system.

Figure 4 presents an operating concept for controlling and reconciling missing shipment information among satellite shipper sites, central translation facilities, CFM system, DTRS, and carriers.



Note: The dotted lines represent processes that should be added to the current operating concept to support electronic GBL tracking. Although not shown in the figure, all transactions (EDI and non-EDI) require Functional Acknowledgments by receiving activities.

Figure 4.
Electronic GBL Tracking Operating Concept

SUMMARY

The problem of missing GBLs in the Defense transportation payment process can be minimized by implementing the original concept of operations and adopting a few system enhancements. The outstanding implementation activities include the capability for tracking GBLs and transmitting electronic GBLs to carriers. The enhancements include providing acknowledgments for all interface transmissions and procedures for monitoring the acknowledgments. These actions are necessary if Defense transportation's EDI program is to succeed.

REPORT DOCUMENTATION PAGE

Form Approved
OPM No.0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources gathering, and maintaining the data needed, and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Information and Regulatory Affairs, Office of Management and Budget, Washington, DC 20503.

1. AGENCY USE ONLY (Leave Blank)		2. REPORT DATE Feb 96	3. REPORT TYPE AND DATES COVERED Final
4. TITLE AND SUBTITLE Defense Transportation EDI Interface Integrity			5. FUNDING NUMBERS C DASW01-95-C-0019 PE 0902198D
6. AUTHOR(S) William T. James III			
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Logistics Management Institute 2000 Corporate Ridge McLean, VA 22102-7805			8. PERFORMING ORGANIZATION REPORT NUMBER LMI- DF501MR1
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) Deputy Director for Finance Operations Defense Finance and Accounting Service — Indianapolis Center 8899 E. 56th Street Indianapolis, IN 46249-0501			10. SPONSORING/MONITORING AGENCY REPORT NUMBER
11. SUPPLEMENTARY NOTES			
12a. DISTRIBUTION/AVAILABILITY STATEMENT A: Approved for public release; distribution unlimited			12b. DISTRIBUTION CODE
13. ABSTRACT (Maximum 200 words) The problem of missing government bills of lading (GBLs) in the Defense transportation payment process, while produced by a variety of causes, can be minimized through completion of the original concept of operations and by implementing a few system enhancements to accommodate some lessons learned. Program completion involves measures to improve GBL tracking and transmission of electronic GBLs to the carriers. Enhancements include providing acknowledgments for all interface transmissions and adequate resources and procedures for monitoring those acknowledgments. Failure to improve the integrity of data exchange across all interfaces will seriously jeopardize the future of Defense transportation's electronic data interchange program. Implementing the recommendations in this report will move the program toward the full achievement of its intended expectations.			
14. SUBJECT TERMS EDI, Interface, Integrity, Government Bill of Lading, GBL(s), Electronic GBL(s), Defense Transportation Payment, Internal Control(s), GBL Tracking.			15. NUMBER OF PAGES 14
			16. PRICE CODE
17. SECURITY CLASSIFICATION OF REPORT Unclassified	18. SECURITY CLASSIFICATION OF THIS PAGE Unclassified	19. SECURITY CLASSIFICATION OF ABSTRACT Unclassified	20. LIMITATION OF ABSTRACT UL